



Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu  
20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
100 105 110

Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
165 170 175

Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
180 185 190

Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys  
195 200 205

Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu  
210 215 220

Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg  
225 230 235 240

Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg  
245 250 255

Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
260 265 270

Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser  
275 280 285

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
290 295 300

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
305 310 315 320

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp

	325	330	335
Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys			
	340	345	350
Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu			
	355	360	365
Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg			
	370	375	380
Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys			
	385	390	395 400
Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys			
	405	410	415
Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn			
	420	425	

<210> 25

<211> 23

<212> DNA

<213> Streptococcus pneumoniae

<400> 25

ggcggatcca tggaraayga rgg

<210> 26

<211> 33

<212> DNA

<213> Streptococcus pneumoniae

<400> 26

gccgtcgact tagtttaccc attcaccatt ggc

33

<210> 27

<211> 5

<212> PRT

<213> Streptococcus pneumoniae

<400> 27

Xaa Glu Asn Glu Gly

1

5

<210> 28

<211> 439

<212> PRT

<213> Streptococcus pneumoniae

<400> 28

Ala Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys

1

5

10

15

Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser

20

25

30

Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys

35

40

45

Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu

50

55

60

Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser

65

70

75

80

Val Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala

85

90

95

Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr

100

105

110

Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala

115

120

125

Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro

130

135

140

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val

145

150

155

160

Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu

165

170

175

Ser Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn

180	185	190
Lys Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu		
195	200	205
Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala		
210	215	220
Asn Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg		
225	230	235 240
Glu Val Xaa Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala		
245	250	255
Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser		
260	265	270
Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu		
275	280	285
Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr		
290	295	300
Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp		
305	310	315 320
Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys		
325	330	335

Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu  
340 345 350

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
355 360 365

Lys Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp  
370 375 380

Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro  
385 390 395 400

Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro  
405 410 415

Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro  
420 425 430

Ala Asp Gln Gln Ala Glu Glu  
435

<210> 29

<211> 437

<212> PRT

<213> Streptococcus pneumoniae

<400> 29

Ala Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys

1	5	10	15
Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Lys Ser			
20	25	30	
Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys			
35	40	45	
Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu			
50	55	60	
Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser			
65	70	75	80
Val Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala			
85	90	95	
Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr			
100	105	110	
Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala			
115	120	125	
Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro			
130	135	140	
Thr Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val			
145	150	155	160



Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
165 170 175

Ser Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn  
180 185 190

Lys Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu  
195 200 205

Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala  
210 215 220

Asn Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg  
225 230 235 240

Glu Val Leu Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
245 250 255

Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser  
260 265 270

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
275 280 285

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
290 295 300

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
305 310 315 320

Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
325 330 335

Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu  
340 345 350

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
355 360 365

Lys Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp  
370 375 380

Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro  
385 390 395 400

Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro  
405 410 415

Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro  
420 425 430

Ala Asp Gln Gln Ala  
435

<210> 30

<211> 439

<212> PRT

<213> Streptococcus pneumoniae

<400> 30

Val Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu

1 5 10 15

Lys Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Glu

20 25 30

Ser Gln Ala Gly His Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile

35 40 45

Lys Thr Met Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Phe Ala

50 55 60

Leu Asn Ile Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Arg Lys Leu

65 70 75 80

Asn Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Pro Ser Glu Thr Lys

85 90 95

Lys Glu Ile Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Asn Arg

100 105 110

Thr Lys Lys Thr Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys

115 120 125

Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr

130 135 140

Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu  
145 150 155 160

Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser  
165 170 175

Arg Asp Asp Glu Lys Ile Lys Gln Ala Glu Ala Lys Val Glu Ser Lys  
180 185 190

Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys  
195 200 205

Ala Glu Glu Glu Ala Lys Arg Arg Ala Glu Ala Lys Leu Lys Glu Ala  
210 215 220

Val Glu Lys Asn Val Ala Thr Ser Glu Gln Asp Lys Pro Lys Gly Arg  
225 230 235 240

Arg Lys Arg Gly Val Pro Gly Glu Gln Ala Thr Pro Asp Lys Lys Glu  
245 250 255

Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Ala Leu Pro  
260 265 270

Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys  
275 280 285

Val Ala Glu Ala Glu Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Arg

290	295	300	
Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala			
305	310	315	320
Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu			
	325	330	335
Glu Ala Lys Glu Ser Arg Asn Glu Glu Lys Val Asn Gln Ala Lys Ala			
	340	345	350
Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys			
	355	360	365
Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu			
	370	375	380
Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro			
385	390	395	400
Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro			
	405	410	415
Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr			
	420	425	430
Asp Asp Gln Gln Ala Glu Glu			
435			

<210> 31

<211> 419

<212> PRT

<213> Streptococcus pneumoniae

<400> 31

Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn

1 5 10 15

Glu Gly Thr Thr Gln Ala Pro Thr Ser Ser Asn Arg Gly Asn Glu Ser

20 25 30

Gln Ala Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Glu

35 40 45

Lys Met Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu

50 55 60

Leu Thr Lys Leu Gly Ala Ile Lys Thr Glu Tyr Leu Arg Gly Leu Ser

65 70 75 80

Val Ser Lys Glu Lys Ser Thr Ala Glu Leu Pro Ser Glu Ile Lys Glu

85 90 95

Lys Leu Thr Ala Ala Phe Lys Gln Phe Lys Lys Asp Thr Leu Lys Pro

100 105 110

Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Ala Glu Ala Lys Lys

115	120	125
Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile		
130	135	140
Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val		
145	150	155
Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg		
165	170	175
Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Lys		
180	185	190
Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Lys Ala		
195	200	205
Glu Glu Glu Ala Lys Arg Arg Val Asp Ala Lys Glu Gln Asp Glu Ser		
210	215	220
Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Val Gly Glu Gln		
225	230	235
Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser		
245	250	255
Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly Lys Lys		
260	265	270

Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Asp Lys Lys Ala Lys  
275 280 285

Ala Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys  
290 295 300

Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala  
305 310 315 320

Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu  
325 330 335

Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala  
340 345 350

Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu  
355 360 365

Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala  
370 375 380

Glu Gln Pro Lys Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Ala Pro  
385 390 395 400

Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp  
405 410 415

Gln Gln Ala



<210> 32

<211> 437

<212> PRT

<213> Streptococcus pneumoniae

<400> 32

Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys Glu

1 5 10 15

Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser Gln

20 25 30

Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys Lys

35 40 45

Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu Leu

50 55 60

Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser Val

65 70 75 80

Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala Lys

85 90 95

Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu

100 105 110

Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys  
115 120 125

Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro Thr  
130 135 140

Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val Glu  
145 150 155 160

Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser  
165 170 175

Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn Lys  
180 185 190

Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu Lys  
195 200 205

Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala Asn  
210 215 220

Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg Glu  
225 230 235 240

Val Phe Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys  
245 250 255

Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser Leu  
260 265 270

Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
275 280 285

Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
290 295 300

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val  
305 310 315 320

Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
325 330 335

Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu Ser  
340 345 350

Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys  
355 360 365

Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp Lys  
370 375 380

Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln  
385 390 395 400

Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro Ala  
405 410 415

Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro Ala

420

425

430

Asp Gln Gln Ala Glu

435

<210> 33

<211> 433

<212> PRT

<213> Streptococcus pneumoniae

<400> 33

Cys Thr Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu

1

5

10

15

Asn Glu Arg Thr Thr Gln Val Pro Thr Ser Ser Asn Arg Gly Lys Pro

20

25

30

Glu Arg Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile Asn Lys Met

35

40

45

Ile Gln Leu Asp Lys Arg Lys His Thr Gln Asn Leu Ala Phe Asn Ile

50

55

60

Gln Leu Ser Arg Ile Lys Thr Glu Tyr Leu Asn Gly Leu Lys Glu Lys

65

70

75

80

Ser Glu Ala Glu Leu Pro Ser Lys Ile Lys Ala Glu Leu Asp Ala Ala

85

90

95

Phe Lys Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys  
100 105 110

Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Val Ala  
115 120 125

Glu Ala Lys Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp His Arg Asn  
130 135 140

Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Phe  
145 150 155 160

Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala  
165 170 175

Asp Glu Ser Arg Asn Glu Gly Thr Ile Asn Gln Ala Lys Ala Lys Val  
180 185 190

Glu Ser Glu Lys Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp  
195 200 205

Arg Glu Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys  
210 215 220

Glu Gln Asp Glu Ser Lys Arg Arg Lys Ser Arg Gly Lys Arg Gly Ala  
225 230 235 240

Leu Gly Glu Gln Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser

	245	250	255
Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys			
	260	265	270
Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Asp			
	275	280	285
Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr			
	290	295	300
Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys			
305	310	315	320
Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser			
	325	330	335
Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys			
	340	345	350
Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys			
	355	360	365
Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys			
	370	375	380
Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu			
385	390	395	400

Lys Pro Ala Glu Glu Pro Glu Asn Pro Val Pro Ala Pro Lys Pro Glu  
405 410 415

Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala  
420 425 430

Glu

<210> 34

<211> 427

<212> PRT

<213> Streptococcus pneumoniae

<400> 34

Val Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu  
1 5 10 15

Lys Glu Val Thr Thr Gln Val Pro Thr Tyr Ser Asn Met Ala Lys Thr  
20 25 30

Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu Lys  
35 40 45

Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Phe  
50 55 60

Ala Phe Asn Met Lys Leu Ser Ala Ile Lys Thr Glu Tyr Leu Tyr Gly





Leu Lys Arg Arg Thr Lys Arg Ala Val Pro Gly Glu Pro Ala Thr Pro  
225 230 235 240

Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu  
245 250 255

Glu Thr Leu Pro Ser Pro Ser Leu Lys Ser Gly Lys Lys Val Ala Glu  
260 265 270

Ala Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
275 280 285

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp  
290 295 300

Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu  
305 310 315 320

Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn Glu Glu Lys Ile Asn  
325 330 335

Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu  
340 345 350

Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg  
355 360 365

Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro  
370 375 380

Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu  
385 390 395 400

Asn Pro Ala Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys  
405 410 415

Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu  
420 425

<210> 35

<211> 413

<212> PRT

<213> Streptococcus pneumoniae

<400> 35

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
145 150 155 160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
165 170 175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
180 185 190

Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
195 200 205

Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala  
210 215 220

Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
225 230 235 240

Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser  
245 250 255

Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val  
260 265 270

Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg  
275 280 285

Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu  
290 295 300

Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu  
305 310 315 320

Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys  
325 330 335

Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr  
340 345 350

Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
355 360 365

Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala

370

375

380

Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln

385

390

395

400

Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu

405

410

&lt;210&gt; 36

&lt;211&gt; 425

&lt;212&gt; PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 36

Tyr Ile Ala Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val

1

5

10

15

Arg Ser Glu Asn Asn Pro Thr Val Thr Ser Ser Gly Gln Asp Ile Ser

20

25

30

Lys Lys Tyr Ala Asp Glu Val Lys Ser His Leu Glu Lys Ile Leu Ser

35

40

45

Glu Ile Gln Thr Asn Leu Asp Arg Ser Lys His Ile Lys Thr Val Asn

50

55

60

Leu Ile Asn Lys Leu Gln Asp Ile Lys Arg Thr Tyr Leu Tyr Glu Leu

65

70

75

80

Asn Val Leu Glu Asp Lys Ser Lys Ala Glu Leu Pro Ser Lys Ile Lys  
85 90 95

Ala Glu Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro  
100 105 110

Thr Glu Pro Gly Lys Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
115 120 125

Ala Glu Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Tyr Arg Asn Tyr  
130 135 140

Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
145 150 155 160

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala Asp  
165 170 175

Glu Ser Arg Asn Glu Gly Thr Ile Asn Gln Ala Lys Ala Lys Val Glu  
180 185 190

Ser Glu Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg  
195 200 205

Glu Lys Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Glu Gln  
210 215 220

Asp Glu Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Phe Gly

225	230	235	240
Glu Pro Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp			
	245	250	255
Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly			
	260	265	270
Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys			
	275	280	285
Ala Lys Asp Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr Ile Thr			
	290	295	300
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys			
305	310	315	320
Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn			
	325	330	335
Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala			
	340	345	350
Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu			
	355	360	365
Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys			
370	375	380	

Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro  
385 390 395 400

Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu  
405 410 415

Lys Pro Ala Asp Gln Gln Ala Glu Glu  
420 425

<210> 37

<211> 439

<212> PRT

<213> Streptococcus pneumoniae

<400> 37

Ala Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val Arg Ser  
1 5 10 15

Gly Asn Asn Ser Thr Val Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys  
20 25 30

Tyr Ala Asp Glu Val Glu Ser His Leu Gln Ser Ile Leu Lys Asp Val  
35 40 45

Asn Lys Asn Leu Lys Lys Val Gln His Thr Gln Asn Ala Asp Phe Asn  
50 55 60

Lys Lys Leu Ser Lys Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Asn Val



65	70	75	80
Leu Glu Glu Lys Ser Glu Ala Glu Leu Thr Ser Lys Thr Lys Glu Thr			
85	90	95	
Lys Glu Glu Leu Thr Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu			
100	105	110	
Ser Thr Glu Pro Glu Lys Lys Val Ala Glu Ala Lys Lys Lys Val Glu			
115	120	125	
Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Arg Arg Asn			
130	135	140	
Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser			
145	150	155	160
Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala			
165	170	175	
Asn Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Lys Val			
180	185	190	
Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp			
195	200	205	
Arg Glu Gln Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg			
210	215	220	

Glu Gln Ala Glu Glu Glu Ala Lys Val Lys Asp Glu Pro Lys Lys Arg  
225 230 235 240

Thr Lys Arg Gly Val Leu Gly Glu Pro Ala Thr Pro Asp Lys Lys Glu  
245 250 255

Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro  
260 265 270

Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys  
275 280 285

Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg  
290 295 300

Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala  
305 310 315 320

Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu  
325 330 335

Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala  
340 345 350

Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys  
355 360 365

Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu  
370 375 380

Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro  
385 390 395 400

Ala Pro Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Pro  
405 410 415

Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro  
420 425 430

Ala Asp Gln Gln Ala Glu Glu  
435

<210> 38

<211> 460

<212> PRT

<213> Streptococcus pneumoniae

<400> 38

Cys Ile Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu  
1 5 10 15

Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu  
20 25 30

Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu Arg  
35 40 45

Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val Gly  
50 55 60

Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val Ala  
65 70 75 80

Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys Ile  
85 90 95

Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu Ser  
100 105 110

Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser  
115 120 125

Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr  
130 135 140

Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala  
145 150 155 160

Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu  
165 170 175

Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu  
180 185 190

Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu  
195 200 205

Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln  
210 215 220

Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys  
225 230 235 240

Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg Arg  
245 250 255

Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly  
260 265 270

Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys  
275 280 285

Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu  
290 295 300

Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
305 310 315 320

Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
325 330 335

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val  
340 345 350

Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu

```

      355              360              365
Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser
    370              375              380

Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys
385              390              395              400

Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val
          405              410              415

Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys Ala
          420              425              430

Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro
          435              440              445

Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu
    450              455              460

<210> 39
<211> 459
<212> PRT
<213> Streptococcus pneumoniae

<400> 39
Ile Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn
    1              5              10              15

```

Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu Ser  
20 25 30

Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu Arg Asp  
35 40 45

Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val Gly Glu  
50 55 60

Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val Ala Leu  
65 70 75 80

Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys Ile Val  
85 90 95

Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu Ser Arg  
100 105 110

Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser Ser  
115 120 125

Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala  
130 135 140

Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala Lys  
145 150 155 160

Lys Lys Val Glu Glu Val Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu

	165	170	175
Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu			
	180	185	190
Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val			
	195	200	205
Lys Val Lys Ala Asn Glu Pro Arg Asp Lys Gln Lys Ile Lys Gln Ala			
	210	215	220
Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys			
	225	230	235
			240
Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg Arg Ala			
	245	250	255
Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Pro Lys Arg Gly Val			
	260	265	270
Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser			
	275	280	285
Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys			
	290	295	300
Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys			
	305	310	315
			320



Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr  
325 330 335

Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu  
340 345 350

Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro  
355 360 365

Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys  
370 375 380

Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys  
385 390 395 400

Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys  
405 410 415

Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys Thr Glu  
420 425 430

Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys  
435 440 445

Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu  
450 455

SEQUENCE LISTING

<110> Tuomanen, Elaine I.

Wizemann, Theresa

Masure, H. R.

Johnson, Leslie S.

Koenig, Scott

<120> POLYPEPTIDE COMPRISING THE AMINO ACID OF AN N-TERMINAL  
CHOLINE BINDING PROTEIN A TRUNCATE, VACCINE DERIVED  
THEREFROM AND USES THEREOF

<130> 1340-1-017 msc

<140> 09/056,019

<141> 1998-04-07

<160> 39

<170> PatentIn Ver. 2.0

<210> 1

<211> 406

<212> PRT

<213> Streptococcus pneumoniae

<400> 1

Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn

1

5

10

15

Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu  
20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
100 105 110

Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu

	165	170	175
Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu			
	180	185	190
Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys			
	195	200	205
Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu			
	210	215	220
Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg			
	225	230	235 240
Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg			
	245	250	255
Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala			
	260	265	270
Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser			
	275	280	285
Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu			
	290	295	300
Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr			
	305	310	315 320

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
325 330 335

Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
340 345 350

Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu  
355 360 365

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg  
370 375 380

Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys  
385 390 395 400

Val Lys Glu Lys Pro Ala  
405

<210> 2

<211> 655

<212> PRT

<213> Streptococcus pneumoniae

<400> 2

Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn  
1 5 10 15

Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu

	20	25	30
Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val			
35	40	45	
Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val			
50	55	60	
Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys			
65	70	75	80
Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu			
85	90	95	
Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser			
100	105	110	
Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp			
115	120	125	
Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu			
130	135	140	
Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys			
145	150	155	160
Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu			
165	170	175	

Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
180 185 190

Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys  
195 200 205

Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu  
210 215 220

Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg  
225 230 235 240

Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg  
245 250 255

Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
260 265 270

Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser  
275 280 285

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
290 295 300

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
305 310 315 320

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
325 330 335

Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
340 345 350

Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu  
355 360 365

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg  
370 375 380

Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys  
385 390 395 400

Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys  
405 410 415

Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln  
420 425 430

Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr Ala  
435 440 445

Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro  
450 455 460

Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys  
465 470 475 480

Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala



485

490

495

Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn

500

505

510

Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr

515

520

525

Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly

530

535

540

Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu

545

550

555

560

Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala

565

570

575

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn

580

585

590

Gly Asp Met Ala Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr

595

600

605

Leu Glu Ala Ser Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser

610

615

620

Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly Ala Leu Ala Val Asn Thr

625

630

635

640

Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn  
645 650 655

<210> 3

<211> 284

<212> PRT

<213> Streptococcus pneumoniae

<400> 3

Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn  
1 5 10 15

Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu  
20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser

100	105	110
Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp		
115	120	125
Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu		
130	135	140
Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys		
145	150	155
		160
Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu		
	165	170
		175
Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu		
	180	185
		190
Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys		
	195	200
		205
Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu		
	210	215
		220
Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg		
	225	230
		235
		240
Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg		
	245	250
		255

Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
260 265 270

Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu  
275 280

<210> 4

<211> 106

<212> PRT

<213> Streptococcus pneumoniae

<400> 4

Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
1 5 10 15

Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
20 25 30

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val  
35 40 45

Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
50 55 60

Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser  
65 70 75 80

Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys

85

90

95

Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala

100

105

&lt;210&gt; 5

&lt;211&gt; 109

&lt;212&gt; PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 5

Thr Glu Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu

1

5

10

15

Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr

20

25

30

Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp

35

40

45

Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn

50

55

60

Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu

65

70

75

80

Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg

85

90

95

Glu Glu Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala

100

105

<210> 6

<211> 4

<212> PRT

<213> Streptococcus pneumoniae

<400> 6

Lys Xaa Xaa Glu

1

<210> 7

<211> 376

<212> PRT

<213> Streptococcus pneumoniae

<400> 7

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys

1

5

10

15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu

20

25

30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn

35

40

45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
145 150 155 160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
165 170 175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
180 185 190

Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys

195	200	205
Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala		
210	215	220
Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn		
225	230	235 240
Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser		
245	250	255
Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val		
260	265	270
Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg		
275	280	285
Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu		
290	295	300
Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu		
305	310	315 320
Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys		
325	330	335
Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr		
340	345	350



Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
355 360 365

Asp Lys Val Lys Glu Lys Pro Ala  
370 375

<210> 8

<211> 663

<212> PRT

<213> Streptococcus pneumoniae

<400> 8

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr

	85	90	95
Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu			
	100	105	110
Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr			
	115	120	125
Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp			
	130	135	140
Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys			
	145	150	155
			160
Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu			
	165	170	175
Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg			
	180	185	190
Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys			
	195	200	205
Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala			
	210	215	220
Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn			
	225	230	235
			240

Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser  
245 250 255

Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val  
260 265 270

Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg  
275 280 285

Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu  
290 295 300

Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu  
305 310 315 320

Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys  
325 330 335

Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr  
340 345 350

Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
355 360 365

Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala  
370 375 380

Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln  
385 390 395 400

Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu Asp Tyr Ala  
405 410 415

Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro  
420 425 430

Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys  
435 440 445

Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala  
450 455 460

Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
465 470 475 480

Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr  
485 490 495

Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly  
500 505 510

Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu  
515 520 525

Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala  
530 535 540

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn

545                      550                      555                      560

Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr

565                      570                      575

Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly

580                      585                      590

Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val

595                      600                      605

Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys

610                      615                      620

Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly

625                      630                      635                      640

Ser Gly Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn

645                      650                      655

Ala Asn Gly Glu Trp Val Asn

660

<210> 9

<211> 254

<212> PRT

<213> Streptococcus pneumoniae

<400> 9

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys

145                      150                      155                      160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
                         165                      170                      175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
                         180                      185                      190

Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
                         195                      200                      205

Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala  
                         210                      215                      220

Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
225                      230                      235                      240

Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu  
                         245                      250

<210> 10

<211> 106

<212> PRT

<213> Streptococcus pneumoniae

<400> 10

Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
1                      5                      10                      15

Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
20 25 30

Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Ser Asp Val  
35 40 45

Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
50 55 60

Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser  
65 70 75 80

Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys  
85 90 95

Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala  
100 105

<210> 11

<211> 107

<212> PRT

<213> Streptococcus pneumoniae

<400> 11

Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu Ala Lys  
1 5 10 15



Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr  
20 25 30

Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys  
35 40 45

Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser  
50 55 60

Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys  
65 70 75 80

Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys  
85 90 95

Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala  
100 105

<210> 12

<211> 1219

<212> DNA

<213> Streptococcus pneumoniae

<400> 12

gagaacgagg gagctacca agtaccact ttttctaata gggcaaatga aagtcaggca 60  
gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagaggtc 120  
gaggaatatg taataaaaaat agtgggtgag agctatgcaa aatcaactaa aaagcgacat 180  
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaa 240

atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300  
 gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360  
 tccactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420  
 aaggtagcag aagctaagaa gaagggtgaa gaagctgaga aaaaagccaa ggatcaaaaa 480  
 gaagaagatc gtcgtaacta cccaaccatt acttacaaaa cgcttgaact tgaaattgct 540  
 gagtccgatg tggaagttaa aaaagcggag cttgaactag taaaagttaa agctaacgaa 600  
 cctcgagacg agcaaaaaat taagcaagca gaagcggag tgagagtaa acaagctgag 660  
 gctacaaggt taaaaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720  
 agagcagatg ctaaagagca aggtaaacca aaggggcggg caaacgagg agttcctgga 780  
 gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtaggt 840  
 gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggtagcaga agctgagaag 900  
 aagggtgaag aagctaagaa aaaagccgag gatcaaaaag aagaagatcg ccgtaactac 960  
 ccaaccaata cttacaaaac gcttgaactt gaaattgctg agtccgatgt ggaagttaaa 1020  
 aaagcggagc ttgaactagt aaaagaggaa gctaaggaaac ctcgaaacga ggaaaaagtt 1080  
 aagcaagcaa aagcggagtg tgagagtaaa aaagctgagg ctacaagggtt agaaaaaatc 1140  
 aagacagatc gtaaaaaagc agaagaagaa gctaaacgaa aagcagcaga agaagataaa 1200  
 gttaaagaaa aaccagctg 1219

<210> 13

<211> 1969

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 13

gagaacgagg gagctacca agtaccact tcttctaata gggcaaatga aagtcaggca 60  
 gaacaaggag aacaaccta aaaactcgat tcagaacgag ataaggcaag gaaagaggtc 120  
 gaggaatatg taaaaaaaat agtgggtgag agctatgcaa aatcaactaa aaagcgacat 180  
 acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaa 240  
 atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300

gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360  
tccactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420  
aaggtagcag aagctaagaa gaagggttga gaagctgaga aaaaagccaa ggatcaaaaa 480  
gaagaagatc gtcgtaacta cccaaccatt acttacaaaa cgcttgaact tgaaattgct 540  
gagtccgatg tggaagttaa aaaagcggag cttgaactag taaaagtga agctaacgaa 600  
cctcgagacg agcaaaaaat taagcaagca gaagcggag ttgagagtaa acaagctgag 660  
gctacaaggt taaaaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720  
agagcagatg ctaaagagca aggtaaacca aaggggcggg caaacgagg agttcctgga 780  
gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtaggt 840  
gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggtagcaga agctgagaag 900  
aaggttgaag aagctaagaa aaaagccgag gatcaaaaag aagaagatcg ccgtaactac 960  
ccaaccaata cttacaaaac gcttgaactt gaaattgctg agtccgatgt ggaagttaaa 1020  
aaagcggagg cttgaactag taaaagagga agctaaggaa cctcgaaacg aggaaaaagt 1080  
taagcaagca aaagcggag ttgagagtaa aaaagctgag gctacaaggt tagaaaaaat 1140  
caagacagat cgtaaaaaag cagaagaaga agctaaacga aaagcagcag aagaagataa 1200  
agttaaagaa aaaccagctg aacaaccaca accagcgccg gtcctaaaag cagaaaaacc 1260  
agctccagct ccaaaaccag agaatccagc tgaacaacca aaagcagaaa aaccagctga 1320  
tcaacaagct gaagaagact atgctcgtag atcagaagaa gaatataatc gcttgactca 1380  
acagcaaccg ccaaaaactg aaaaaccagc acaaccatct actccaaaaa caggctggaa 1440  
acaagaaaac ggtatgtggt acttctacaa tactgatggt tcaatggcga caggatggct 1500  
ccaaaacaat ggctcatggt actacctcaa cagcaatggc gctatggcga caggatggct 1560  
ccaaaacaat ggttcatggt actatctaaa cgctaaggt tcaatggcaa caggatggct 1620  
ccaaaacaat ggttcatggt actacctaaa cgctaaggt tcaatggcga caggatggct 1680  
ccaatacaat ggctcatggt actacctaaa cgctaaggt tcaatggcga caggatggct 1740  
ccaatacaat ggctcatggt actacctaaa cgctaaggt gatatggcga cagggtgggt 1800  
gaaagatgga gatacctggt actatcttga agcatcaggt gctatgaaag caagccaatg 1860  
gttcaaagta tcagataaat ggtactatgt caatggctca ggtgcccttg cagtcaacac 1920  
aactgtagat ggctatggag tcaatgcaa tggatgaatgg gtaaaactaa 1969

<210> 14

<211> 853

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 14

```
gagaacgagg gagctacca agtaccact tcttctaata gggcaaata aagtcaggca 60
gaacaaggag aacaaccta aaaactcgat tcagaacgag ataaggcaag gaaagaggtc 120
gaggaatatg taataaaaaat agtgggtgag agctatgcaa aatcaactaa aaagcgacat 180
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaa 240
atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300
gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360
tccactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420
aaggtagcag aagctaagaa gaagggtgaa gaagctgaga aaaaagccaa ggatcaaaaa 480
gaagaagatc gtcgtaacta cccaaccatt acttacaaaa cgcttgaact tgaaattgct 540
gagtccgatg tggaagttaa aaaagcggag cttgaactag taaaagtga agctaacgaa 600
cctcgagacg agcaaaaaat taagcaagca gaagcggaag ttgagagtaa acaagctgag 660
gctacaaggt taataaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720
agagcagatg ctaaagagca aggtaaacca aaggggcggg caaacgagg agttcctgga 780
gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtaggt 840
gaagaaactc ttc 853
```

<210> 15

<211> 318

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 15

```
aaaccagaaa aaaaggtagc agaagctgag aagaagggtg aagaagctaa gaaaaaagcc 60
```

gaggatcaaa aagaagaaga tcgccgtaac tacccaacca atacttaca aacgcttgaa 120  
 cttgaaattg ctgagtccga tgtggaagtt aaaaaagcgg agcttgaact agtaaaagag 180  
 gaagctaagg aacctcgaaa cgaggaaaaa gttaagcaag caaaagcgga agttgagagt 240  
 aaaaaagctg aggctacaag gttagaaaaa atcaagacag atcgtaaaaa agcagaagaa 300  
 gaagctaaac gaaaagca 318

<210> 16

<211> 327

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 16

acagaaccag gagaaaaggt agcagaagct aagaagaagg ttgaagaagc tgagaaaaaa 60  
 gccaaaggatc aaaaagaaga agatcgtcgt aactaccaa ccattactta caaaacgctt 120  
 gaacttgaaa ttgctgagtc cgatgtggaa gttaaaaaag cggagcttga actagtaaaa 180  
 gtgaaagcta acgaacctcg agacgagcaa aaaattaagc aagcagaagc ggaagttgag 240  
 agtaaacaag ctgagggtac aagggttaaaa aaaatcaaga cagatcgtga agaagcagaa 300  
 gaagaagcta aacgaagagc agatgct 327

<210> 17

<211> 1129

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 17

gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60  
 aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tggtgaggga gattcaacta 120  
 gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180  
 aagtatttgc gtgaattaaa tgtttttagaa gagaagtcga aagatgagtt gccgtcagaa 240

ataaaagcaa agttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300  
 gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360  
 aaagaagaag atcgtcgtaa ctaccaacc aatacttaca aaacgcttga acttgaaatt 420  
 gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480  
 gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540  
 gaggctacaa ggttagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600  
 cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660  
 aaggggcggg caaaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaat 720  
 gatgcgaagt cttcagattc tagcgtaggt gaagaaactc ttccaagctc atccctgaaa 780  
 tcaggaaaaa aggtagcaga agctgagaag aaggttgaag aagctgagaa aaaagccaag 840  
 gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900  
 gaaattgctg agtccgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 960  
 gctaaggaac ctcgagacga ggaaaaaatt aagcaagcaa aagcgaaagt tgagagtaaa 1020  
 aaagctgagg ctacaagggt agaaaacatc aagacagatc gtaaaaaagc agaagaagaa 1080  
 gctaaacgaa aagcagcaga agaagataaa gttaaagaaa aaccagctg 1129

<210> 18

<211> 1992

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 18

gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60  
 aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tggtgagggg gattcaacta 120  
 gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180  
 aagtatttgc gtgaattaaa tgtttttagaa gagaagtcga aagatgagtt gccgtcagaa 240  
 ataaaagcaa agttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300  
 gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360  
 aaagaagaag atcgtcgtaa ctaccaacc aatacttaca aaacgcttga acttgaaatt 420

gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480  
gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540  
gaggctacaa ggtagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600  
cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660  
aaggggcggg caaaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaat 720  
gatgcgaagt cttcagattc tagcgtagggt gaagaaactc ttccaagctc atccctgaaa 780  
tcaggaaaaa aggtagcaga agctgagaag aagggtgaag aagctgagaa aaaagccaag 840  
gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900  
gaaattgctg agtccgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 960  
gctaaggaac ctcgagacga ggaaaaaatt aagcaagcaa aagcgaaggt tgagagtaaa 1020  
aaagctgagg ctacaagggt agaaaacatc aagacagatc gtaaaaaagc agaagaagaa 1080  
gctaaacgaa aagcagcaga agaagataaa gttaaagaaa aaccagctga acaaccacaa 1140  
ccagcgccgg ctactcaacc agaaaaacca gctccaaaac cagagaagcc agctgaacaa 1200  
ccaaaagcag aaaaaacaga tgatcaacaa gctgaagaag actatgctcg tagatcagaa 1260  
gaagaatata atcgcttgac tcaacagcaa ccgcaaaaaa ctgaaaaacc agcacaacca 1320  
tctactcaa aaacaggctg gaaacaagaa aacgggtatgt ggtacttcta caatactgat 1380  
ggttcaatgg caacaggatg gtcctaaaac aacgggttcat ggtactatct aaacgctaata 1440  
ggtgctatgg cgacaggatg gtcctaaaac aatgggttcat ggtactatct aaacgctaata 1500  
ggttcaatgg caacaggatg gtcctaaaac aatgggttcat ggtactacct aaacgctaata 1560  
ggtgctatgg cgacaggatg gtcctaatc aatgggttcat ggtactacct aaacagcaata 1620  
ggcgctatgg cgacaggatg gtcctaatc aatgggttcat ggtactacct caacgctaata 1680  
ggtgatatgg cgacaggatg gtcctaaaac aacgggttcat ggtactacct caacgctaata 1740  
ggtgatatgg cgacaggatg gtcctaatc aacgggttcat ggtattacct caacgctaata 1800  
ggtgatatgg cgacagggtt ggtgaaagat ggagatacct ggtactatct tgaagcatca 1860  
ggtgctatga aagcaagcca atgggtcaaa gtatcagata aatgggtacta tgtcaatggc 1920  
tcagggtgcc ttgcagtcaa cacaactgta gatggctatg gagtcaatgc caatgggtgaa 1980  
tgggtaaaact aa

1992

<211> 763

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 19

```
gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tgttgagggg gattcaacta 120
gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180
aagtatttgc gtgaattaaa tgttttagaa gagaagtcga aagatgagtt gccgtcagaa 240
ataaaagcaa agttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300
gaaaaggtag cagaagctaa gaagaaggtt gaagaagcta agaaaaaagc cgaggatcaa 360
aaagaagaag atcgtcgtaa ctaccaacc aatacttaca aaacgcttga acttgaaatt 420
gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480
gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540
gaggctacaa ggtagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660
aaggggcggg caaaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaat 720
gatgcgaagt cttcagattc tagcgtaggt gaagaaactc ttc 763
```

<210> 20

<211> 318

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 20

```
aaatcaggaa aaaaggtagc agaagctgag aagaaggttg aagaagctga gaaaaaagcc 60
aaggatcaaa aagaagaaga tcgccgtaac tacccaacca atacttaca aacgcttgac 120
cttgaaattg ctgagtcgga tgtgaaagtt aaagaagcgg agcttgaact agtaaaagag 180
gaagctaagg aacctcgaga cgaggaaaaa attaagcaag caaaagcgaa agttgagagt 240
```



aaaaaagctg aggctacaag gttagaaaac atcaagacag atcgtaaaaa agcagaagaa 300  
gaagctaaac gaaaagca 318

<210> 21

<211> 321

<212> DNA

<213> Streptococcus pneumoniae

<400> 21

ccaggagaaa aggtagcaga agctaagaag aaggttgaag aagctaagaa aaaagccgag 60  
gatcaaaaag aagaagatcg tcgtaactac ccaaccaata cttacaaaac gcttgaactt 120  
gaaattgctg agttcgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 180  
gctaaagaat ctcgaaacga gggcacaatt aagcaagcaa aagagaaagt tgagagttaa 240  
aaagctgagg ctacaagggt agaaaacatc aagacagatc gtaaaaaagc agaagaagaa 300  
gctaaacgaa aagcagatgc t 321

<210> 22

<211> 121

<212> PRT

<213> Streptococcus pneumoniae

<400> 22

Ser	Pro	Ser	Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys
1				5					10					15	

Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg
				20				25						30	

Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

35

40

45

Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu

50

55

60

Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala

65

70

75

80

Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys

85

90

95

Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu

100

105

110

Glu Asp Lys Val Lys Glu Lys Pro Ala

115

120

&lt;210&gt; 23

&lt;211&gt; 122

&lt;212&gt; PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 23

Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys

1

5

10

15

Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp

20

25

30

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile  
35 40 45

Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys  
50 55 60

Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys  
65 70 75 80

Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile  
85 90 95

Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala  
100 105 110

Glu Glu Asp Lys Val Lys Glu Lys Arg Ala  
115 120

<210> 24

<211> 428

<212> PRT

<213> Streptococcus pneumoniae

<400> 24

Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn  
1 5 10 15